U.S. INFORMATION SERVICES VERTICAL MARKETS, 1986-1991 MEDICAL SECTOR

MAY 1986

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CONTENTS

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EXHIBITS

I ISSUES, TRENDS, AND EVENTS

A. MEDICAL INDUSTRY TRENDS

- The health care industry of today is very different from that of only three years ago. This is due in part to the implementation of prospective payments, known as Diagnosis-Related Groups (DRGs), for Medicare patients versus the former cost-based payments system.

- Because of the change three years ago in the reimbursement mechanism, the one really significant issue for health care in the 1980s is cost and the control of cost. Automated systems will play an important role in improving cost containment and institutional efficiency. Effective information systems are necessary for health care institutions to survive.

- The pressure on medical institutions to become more efficient through automation continues to intensify. Competition for health care dollars has increased while the growth rate for medical spending for the overall industry has slowed.

  - In 1984, the last year for which the U.S. Department of Health and Human Services has figures, the rate of growth in health care spending fell below double digits, to 9%, for the first time in two decades.

- However, health care's share of the total U.S. GNP has increased from 8.5% in 1972 to 10.5% in 1984.

- According to the 1986 U.S. Industrial Outlook: "Expenditures on health care are expected to rise 10% to $466 billion in 1986. Further rapid growth is seen for health maintenance organizations (HMOs), other prepaid plans, home health agencies, freestanding emergency centers, and investor-owned hospitals. The industry also will experience further fundamental change and high profitability in certain areas. Heretofore declining hospital admissions and lengths of stay should stabilize, but expenditures on health care will continue to rise faster than the overall rate of inflation."

- For the overall market, the major trends are:

  - Decreasing demand for hospital services.

  - Slower growth in U.S. health care spending.

  - Rapid proliferation of alternate sites for the delivery of health care; that is, the delivery of health services outside the costly hospital setting.

  - The emergence of a "contract" health delivery system.

  - Larger group practices.

  - Hospitals and group practices beginning to tie together, vying for market position.

  - HMO and PPO enrollments continuing to grow, making them major forces in the industry.

B. HOSPITALS

- The major trends impacting hospitals are:

  - The length of time patients stay in hospitals ("patient days") is decreasing, but, simultaneously, people are making more out-patient visits and greater use of nursing homes, home-care institutions, and emergency health care centers. In short, multi-systems of health care are evolving in the health care industry.

  - In reaction to the changing competitive environment, hospitals and other health care providers are trying to transform themselves into integrated health care providers, with services ranging from out-patient, home care, and long-term care of the elderly to mental health and drug abuse therapy.

  - There is a growing convergence of hospital and physician data processing needs. These two groups are becoming involved in cooperative ventures to preserve market share. Hospitals have an interest in networking physicians' offices into the hospital's patient care system, which increases the attractiveness to doctors of practicing at that hospital. The competitive advantage will go to the hospital that offers doctors the most access and ease of use in monitoring and tracking patients.

  - As a consequence of the change in reimbursement for health care, many hospitals are experiencing lower numbers of patients, shorter patient stays, and financial hardship. All have an increased need for information concerning their operations.

  - Pressures to contain costs now have hospital administrators thinking in terms of efficiency. They're acting to reduce costs and increase patient volume.

- Over the past three years, the federal government has been the primary force behind pressure exerted on hospitals to cut costs by:

  - Establishing Diagnostic-Related Groups (DRGs), which shift reimbursement plans from cost-based to a fixed cost.

  - Freezing reimbursements under Medicare in 1985.

  - Reducing physical plant financing.

- The fixed-reimbursement plan instituted in 1983 continues to squeeze hospital profit margins. Hospitals have coped by sending patients home earlier, cutting labor costs, and delaying large capital equipment purchases. Operating more efficiently by having more control over the business end has become a major goal. As a result, there is an increased awareness of the need to use information technology to cut costs and improve services.

- In 1985 Medicare implemented its Prospective Payment System (PPS). Under PPS, reimbursements to hospitals and doctors for services rendered would be frozen at the fiscal 1985 level, rather than allow the historical 5%-6% annual increase for 1986.

  - The passage of the Gramm-Rudman Act suggests to hospital executives that the squeeze will intensify because there will be continued efforts to cut federal government expenditures on health care.

- Increasing cost pressures on hospitals have prompted them to find ways of increasing efficiency and productivity. Computer automation is one solution to these cost issues.

  - The new reimbursement system makes control of costs and knowledge of profitability of various hospital operations an important competitive

weapon. It has led to high demand for productivity improvement and hospital case mix analysis applications and for integration of hospital information systems.

- Separate systems for finance, accounting, patient care, pharmacy, medical records, and radiology must be integrated.

- DRG-based reimbursements demand up-to-the-minute information on patient treatments and related costs. On-line systems are now a requirement.

C. PHYSICIANS

- During recent years, the number of medical group practices has increased substantially as a result of greater specialization in medical practice, lower operating costs associated with group practice, and greater patient acceptance. There are currently about 30,000 medical group practices in the U.S. The information processing requirements of group practices has increased due to two factors in particular:

  - Group practice size and patient volume have increased.

  - Increased patient use of third-party reimbursement programs, which require greater documentation of services provided.

- Other information processing requirements include prompt and accurate completion of forms for third-party reimbursement, physician productivity measurement and analysis, and inventory control.

D. DEFINITIONS

- Definitions of medical terms used are as follows:

  - HMOs - A patient pays a predetermined monthly fee for a range of health care services rather than paying for individual services rendered.

  - PPOs - These provide discount rate health care to plan members in exchange for prompt payment and a guaranteed patient base. PPOs are favored by employers with large local facilities who thus bypass third-party payors.

  - DRGs - This system catalogs illnesses requiring hospitalization and determines the length of stay and treatment guidelines for hospitals and doctors. The hospital receives the same payment for every patient in a given "Diagnostic-Related Group (DRG)," no matter what the actual length of the hospital stay and regardless of what real expenses are incurred. This is a departure from the previous method of providing a full range of patient services and receiving 100% reimbursement from the federal government.

II MARKET FORECASTS

A. INTRODUCTION

- The health care market is diverse. The information requirements of a 100-bed hospital are very different from those of a 500-bed hospital, while the requirements of a teaching institution are different from those of a community hospital.

- The SIC for this market sector is 80 (801-809). This includes Physicians, Dentists, Osteopaths, Health Practitioners, Nursing Homes, Hospitals, Medical and Dental Laboratories, Outpatient Care Facilities, and Health and Allied Services.

- INPUT divides the medical sector into three segments: hospitals (which includes nursing homes); physicians (which includes dentists, group practices, and other doctors); and other medical organizations.

- Demand for industry-specific medical segment applications will grow 23% annually through 1991, increasing from $2.1 billion in 1986 to over $5.9 billion in 1991. For details see Exhibits II-1 through II-3 and Appendix Exhibit ME-1.

- Appendix ME contains the forecast data base for each year from 1985 to 1991 for the medical sector as well as for the Hospital, Physician, and Other Medical sectors.

EXHIBIT II-1

MEDICAL SECTOR
TOTAL USER EXPENDITURES, 1986-1991

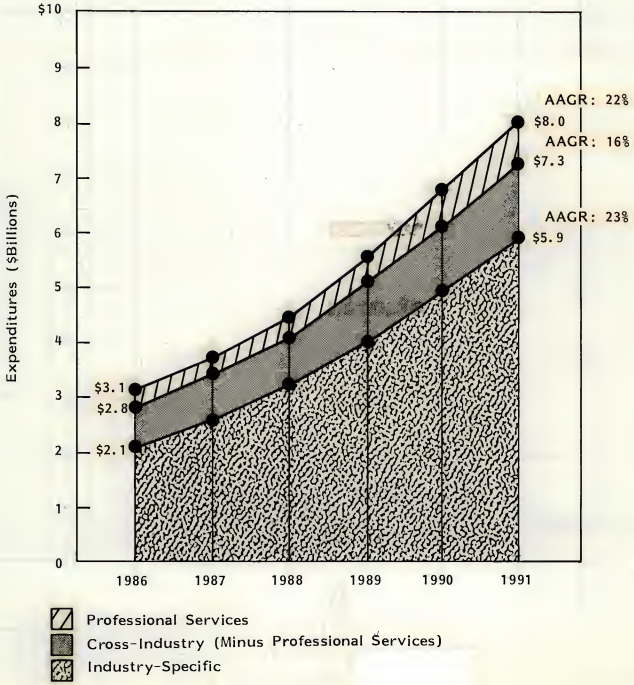
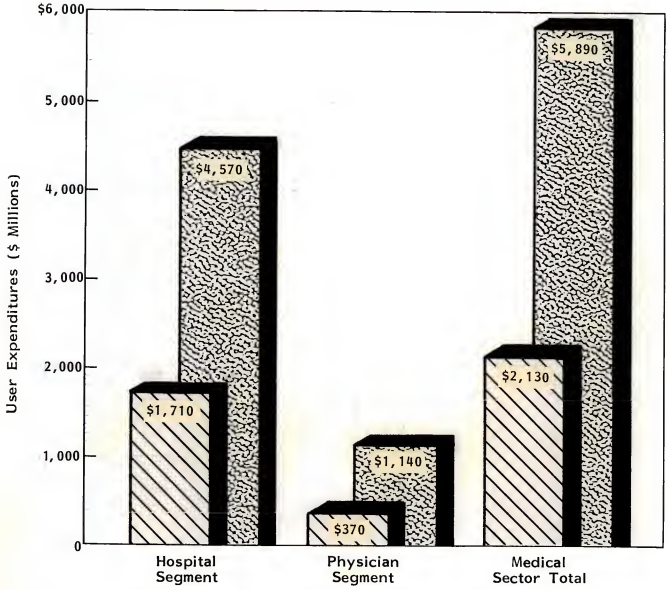


EXHIBIT II-2

MEDICAL SECTOR MARKET FORECAST COMPARISON
INDUSTRY-SPECIFIC INFORMATION SERVICES, 1986-1991



Average Annual Growth Rate	22%	25%	23%

1986

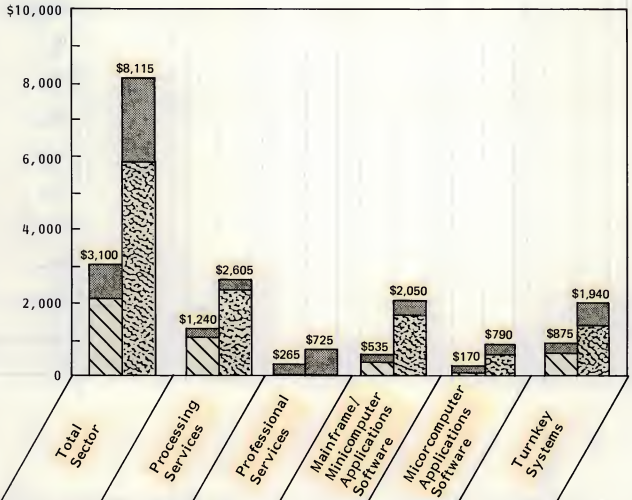
1991

Note: Some segments included in the Medical Sector total are not broken out.

EXHIBIT II-3

MEDICAL SECTOR USER EXPENDITURE FORECAST BY DELIVERY MODE

1986-1991



	Total Sector	Processing Services	Professional Services	Mainframe/ Minicomputer Applications Software	Micorcomputer Applications Software	Turnkey Systems	
Total Sector	21%	16%	22%	31%	35%	17%	1986-1991 Average Annual Growth Rate
Industry-Specific	23%	12%	–	35%	49%	18%	
Cross-Industry	18%	16%	22%	19%	21%	15%	

1986 1991 Cross-Industry

Note: All dollars are rounded to the nearest $5 Million

B. HOSPITALS

- The hospital information systems marketplace is very fragmented. There are approximately 160 vendors supplying the market; 135 of those are less than $10 million in revenue.

- Underlying this growth in information services spending is the continued growth in hospital segment revenues, as seen in Exhibit II-4. The growth will continue, but at slightly lower rates due to the continued effects of government cost containment programs.

- The hospital segment is by far the largest, with $1.7 billion in 1986 sales. For details see Exhibit II-4 and Appendix Exhibit ME-2.

  - Hospital information services spending will grow 22% annually through 1991, with 1991 expenditures totaling $4.6 billion.

  - Mainframe and microcomputer applications software for the hospital sector is expected to grow 34% and 46% respectively through 1991.

  - Underlying this growth is the increasing price/performance of software and turnkey system products, making them more attractive for previously marginal applications.

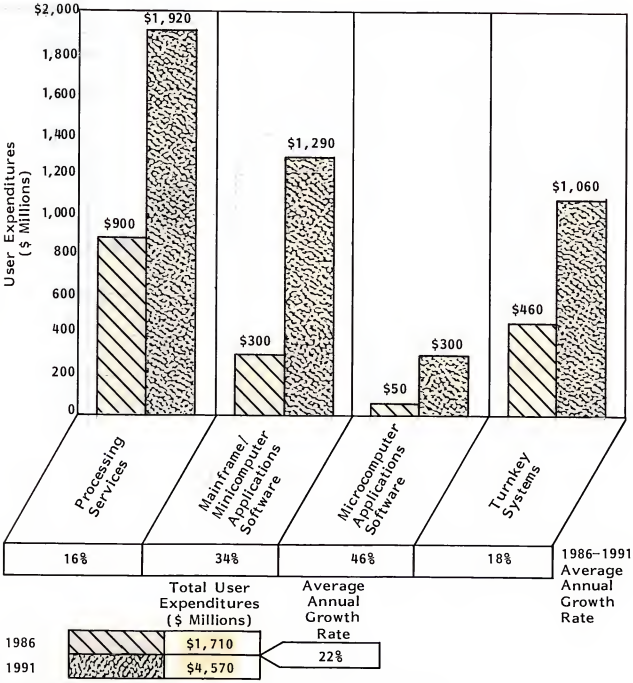
- The level of spending for hospital computer software and services will continue to increase for the five-year forecast period, primarily because:

  - Hospitals will be buying information systems as one of the most effective ways of containing costs under a rapidly changing regulatory environment.

EXHIBIT II-4

HOSPITAL SEGMENT FORECAST

INDUSTRY-SPECIFIC INFORMATION SERVICES, 1986-1991



Note: All dollars are rounded to the nearest $10 million.

INPUT

- The information needs of hospitals are growing rapidly and changing dramatically due to changing reimbursement schemes and heightened competitive pressures.

- The technology and price/performance characteristics of computer systems are improving, thereby expanding the application of computers and enabling a much larger number of hospital personnel to use the systems effectively.

- There will continue to be a demand for labor-saving automation, especially in the labor-intensive hospital environment, where much of that labor involves the handling of information multiple times by multiple users.

- Replacement of old standalone financial systems with integrated financial systems will continue.

- Factors contributing to the slowdown in the rate of spending for hospital information systems are:

  - Sharp declines in hospital activity, which lead to revenue declines and profit decreases.

  - Increasing cost pressures on hospitals, limiting the amount of money available for information services.

- Hospital information systems are made up of four major components:

  - Patient care systems (patient admitting, transfer, and discharge).

  - Departmental systems (laboratory, pharmacy, radiology).

- Financial information (payroll, scheduling, purchasing, inventory, patient billing, and reimbursement).

- Decision support (budgeting and planning systems).

- Financial and patient care systems dominate the industry services, constituting more than 80% of the revenue derived from hospitals. Laboratory and pharmacy functions follow at a distant third and fourth positions.

- The financial systems business consists primarily of a replacement market (over 95% of hospitals have a financial system). Some hospitals are considering adding modules to their existing software packages, such as billing, payroll, inventory control, and DRG/case mix analysis.

- The patient care systems market is still relatively unpenetrated (only about one-third of all hospitals have such systems) and offers major opportunities for hospital information service companies. Patient care systems typically incorporate order entry; results reporting; patient admissions, discharge, and transfer; and nurse staffing activities.

  - The increasing sophistication of vendors' offerings is making these applications more attractive to customers who have not yet adopted them; market penetration can be expected to increase substantially in the near future.

- Pharmacy and laboratory applications are the fastest growing; however, they form a relatively small part of hospital operations and will never approach the size of the other main applications.

C. PHYSICIANS

- The physician segment, although currently less than 17% of the total market, will grow at a rate of 25%, as shown in Exhibit II-5 and Appendix Exhibit ME-3.

- The physician market is highly fragmented, with no single vendor representing more than 10% of total segment information services. CyCare Systems is the largest provider of information services to the Physician segment.

- According to figures published in the Journal of the American Medical Association (JAMA) and the Journal of Family Practice, approximately 380,000 doctors want to computerize their offices in the next few years. Some 300 companies are developing software for that market.

  - Currently, only about 14% of doctors' offices are automated, primarily because most of the current systems are to difficult to use.

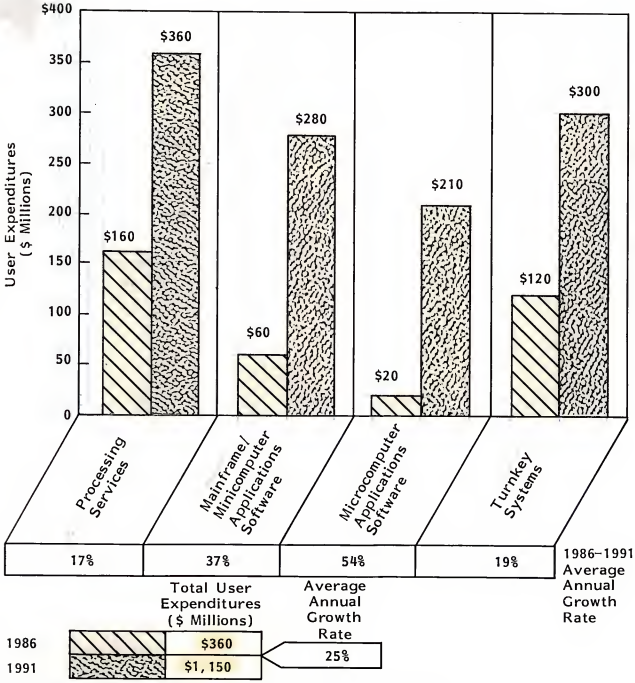
- Decreasing hardware costs and increased availability of functional software will make turnkey systems and applications software especially attractive to currently unautomated offices.

- The trend toward larger group practices at the expense of one- and two-person operations is aiding this growth. These larger organizations are more likely to have both the resources and the organizational need for automation.

- Microcomputer-based turnkey systems and microcomputer software are major growth areas for the physician market. However, penetrating the physician market is considered very difficult, one reason being the difficulty in getting in to see a doctor to try to sell him/her on the system. In addition, there are too many companies in the market already. Any new vendor of microcomputer software or turnkey systems will have to focus on a narrow niche.

EXHIBIT II-5

PHYSICIAN SEGMENT FORECAST
INDUSTRY-SPECIFIC INFORMATION SERVICES, 1986-1991



Note: All dollars are rounded to the nearest $10 million.

INPUT

D. OTHER MEDICAL MARKET

- The Other Medical segment will grow rapidly, at a rate of 27% a year, as shown in Exhibit II-6 and Appendix Exhibit ME-4. Included in this segment are outpatient clinics, laboratories, and alternate care facilities. The dramatic growth in alternate care facilities is fueling the growth in this segment.

E. PROCESSING SERVICES

- Shared systems will continue to thrive in offices recently introduced to automation, growing at an average annual growth rate of 16% over the five-year period. However, as the users become more computer literate and aware of the benefits of computing, they will turn increasingly to in-house systems. Some vendors, like McDonnell Douglas Physician Systems, have developed in-house systems that link to their hosts. This covers both ends and secures the client relationship. Batch data processing in hospitals in highly competitive urban and suburban markets will most likely move toward on-line data processing. Rural hospital markets may remain well served by batch data processing for the forseeable future.

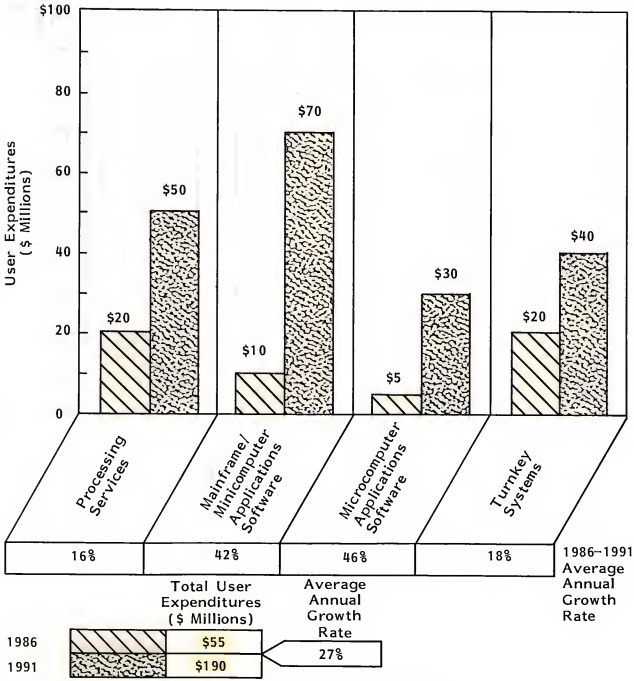
- The most significant factor in the continued consistent growth of processing services facilities management is the difficulty hospitals have in staffing complete information systems departments.

F. TURNKEY SYSTEMS

- Turnkey vendors are still increasing market share at the expense of processing services, growing at the rate of 18% per year for the forecast period. The

EXHIBIT II-6

OTHER MEDICAL SEGMENT FORECAST
INDUSTRY-SPECIFIC INFORMATION SERVICES, 1986-1991



Note: All dollars are rounded to the nearest $10 million.

INPUT

increased performance of computer systems (lower cost of hardware, increased performance of software) has resulted in a greater use of turnkey and in-house computer systems, with a resultant slower growth in processing services. However, many hospitals use a mixture of turnkey and RCS services.

- Rapid growth is expected for turnkey systems developed for departmental applications (e.g., radiology, pharmacy, and medical records).

G. SOFTWARE

- Software will grow at a rapid 38% average annual growth rate (AAGR) due to several factors:

  - The continued increase in the installed base of hardware, allowing correspondingly greater opportunities for selling software.

  - Greater willingness on the part of IS departments to buy software.

  - Increased functionality of software, is leading to greater customer acceptance.

H. PROFESSIONAL SERVICES

- Professional services will grow at an AAGR of 22%. The increasing need to integrate hospital data processing and communications systems with those in physicians' offices, third-party reimbursers, and occupation health facilities is creating an increased demand for consulting and facilities management services. In addition, the continued inability of hospitals to afford or attract an information services staff will lead to continued strong growth in the professional services market.

III COMPETITIVE DEVELOPMENTS

A. INTRODUCTION

- The medical information systems market is characterized by:
  - The presence of large, well-established vendors.
  - The continued consolidation of vendors, creating even larger competitors.
- The leading vendors of information services for the medical market are positioning themselves as full-line suppliers, selling the full range of delivery modes to all the key markets. Vendors with a broad product line are rapidly increasing their market share as users shop for a single-source system.
- The market shares of the leading vendors in the medical sector are shown in Exhibit III-1.
- The leaders in the financial information system market are:
  - Shared Medical Systems (SMS) and McDonnell Douglas Health Systems, leaders in processing services.

EXHIBIT III-1

VENDOR SHARES OF MEDICAL SECTOR INDUSTRY-SPECIFIC INFORMATION SERVICES IN 1985

($ Millions)

VENDOR NAME	PROCESSING	APPLICATIONS SOFTWARE	TURNKEY SYSTEMS	PROFESSIONAL SERVICES	TOTAL	PERCENT[3] SHARE OF TOTAL MEDICAL INFORMATION SERVICES (1985)
Shared Medical Systems	$ 167	10	$ 125	10	$ 312	16%
McDonnell Douglas	150	-	70	-	220[4]	11
HBO and Company[1]	22.8	26	115	25	188.8	10
IBM	-	50	50	-	100[5]	5
Baxter Travenol[2]	10	30	5	55	100	5
CyCare Systems	21.1		26.3	1.2	48.6	2
Technicon	8	30	2	8	48	2
Systems Assoc.	-	-	32.8	-	32.8	2
MEDITECH	-	19	-	-	19	1
Keane, Inc.	11.5	2.5	-	-	14	1
Total	$ 390.4	$167.5	$426.1	$99.2	$1,083.2	55%

1 Includes Amherst Associates and Mediflex Systems
2 Includes Compucare
3 Total includes industry-specific and professional services
4 INPUT estimate
5 INPUT estimate

- HBO & Company, Travenol, System Associates, Computer Synergy, American Medical International, and Sentry Data, leaders in the turnkey systems market.

- Mediflex and Health Information Systems, leaders in the software market.

- The leaders in management information systems are Amherst Associates (now a subsidiary of HBO & Company), SMS, Mediflex Systems Corporation (now a subsidiary of HBO & Company), and Ernst and Whinney.

- The leaders in patient care systems include HBO & Company, SMS, Technicon Data Systems, McDonnell Douglas Health Systems, IBM, Electronic Data Systems (EDS), and CyCare Systems.

B. ACQUISITIONS

- Acquisition activity in 1985 was the strongest in the history of the medical industry and the trend in mergers will continue. Many of the specialty companies that exist today will be bought out and incorporated into larger corporations. There are more than 160 firms selling computer systems to hospitals, and more firms will join together to survive in the competitive market.

  - The trend will be toward a consolidation of vendors as hospitals turn increasingly toward single-source, broadline vendors who can supply the products and services required by an increasingly demanding marketplace.

- Due to Medicare's Prospective Payment System (PPS), hospitals must buy better, more modern systems to merge clinical and financial data, classify

their DRGs, and intensely analyze their case mix. Every hospital vendor will have to build or buy such capabilities, so more acquisitions are likely, especially of smaller companies who have successfully exploited the case mix/DRG niche.

- The significant mergers and acquisitions in 1985 for the hospital information services industry include:

  - HBO & Company acquired two vendors in February 1985--Mediflex Systems and Amherst Associates.

  - Baxter Travenol Laboratories acquired Compucare in May 1985.

  - Shared Medical Systems acquired Computer Synergy in May 1985.

C. VENDOR PROFILES

- The following are profiles of the leading vendors in the medical market.

1. IBM

   a. Products/Services

- IBM has an extensive family of applications software products for the health care industry. The IBM Patient Care System, designed for intermediate and large hospitals, includes PCS-Patient Management, PCS-Patient Accounting, and PCS-Application Development System.

  - The Patient Management application establishes a patient data base at admissions that is then used by the other hospital applications.

- The Patient Accounting application, announced in 1984, automates the billing and collection procedures and is designed to enhance cash flow management and contain costs.

- The Application Development System is an application generator that produces applications from a set of building blocks.

b. Markets Served

- Hospitals.

c. Company Strategy

- IBM plans to continue to be a leader in all aspects of providing needed information systems solutions to all segments of the medical industry. IBM's plan and approach is to offer flexible and integrated products, working with its network architecture to allow the hospital to integrate all information functions and requirements from a central data base.

d. Recent Activities

- The IBM Hospital Information System/36, announced in 1985, is designed for smaller hospitals. This system provides patient care, patient management, and patient accounting functions in hospitals with little or no data processing knowledge.

- IBM has recently launched a joint study with General Electric Medical Systems to experiment with an approach to combine images and diagnostic reports with patient data taken from hospital and radiology information systems. They are working toward the timely integration of all diagnostic patient information--patient history, lab analysis, reports, and images--in order to increase efficiency and provide cost-effective diagnoses.

e. Future Direction

- The future thrust involves extending the capabilities of the integrated network. IBM plans to expand its hospital information system to include hardware systems, software systems, and communication links to all departments within a hospital that have a need to pass data to the host or to one another, to the staff physician's office or home, to organizations representing alternate delivery systems, to insurance companies, and to medical data bases.

2. MCDONNELL DOUGLAS HEALTH SYSTEMS COMPANY (MDHSC)

a. Products/Services

- Processing services and turnkey systems.

- The McDonnell Douglas Physician Systems Company subsidiary provides financial systems (both shared and turnkey) services to more than 25,000 physicians and nearly 500 clinics and medical groups as well as over 30 medical schools and colleges.

b. Markets Served

- Financial and patient information systems for hospitals, clinics, medical groups, and laboratories. MDHSC markets shared and turnkey systems that record, process, and report financial data, patient care activity, and medical records information for nearly every hospital department.

c. Company Strategy

- MDHSC is positioning itself to be a leading provider in the health services market through its acquisition of Tymshare, Science Dynamics, and Vitek Systems. The company's strategy emphasizes communications network capabilities and timesharing in support of turnkey systems.

d. Recent Activities

- The Health Services Division of McDonnell Douglas has been reorganized. The McDonnell Douglas Health Systems Company was formed as a component of the McDonnell Douglas Information Systems Group. This new company, which focuses on providing information services to the health care market, is comprised of the following four businesses, each of which markets a different set of products to the health care industries.

  - McDonnell Douglas Health Information Systems Company.

  - Vitek Systems Company.

  - Bactomatic Inc.

  - McDonnell Douglas Physician Systems Company.

- Through the acquisition of Science Dynamics, MDHSC moved into the physician market, a key feeder into its future network with the hospital at the network's center.

e. Future Direction

- The company plans to integrate financial and patient care information with clinical information. In 1984, approximately 75% of MDHSC's business was timeshare and 25% was turnkey systems. The company forecasts that by 1990 that ratio will be reversed. It feels that its timesharing services will serve as an integral part of the turnkey systems that it sells. Thus, future growth will lie in turnkey systems with connections to timesharing networks.

- MDHSC is planning to provide systems that link physicians, HMOs, alternative care units, ambulatory units, and "emergicenters" into a feeder network for

the hospital and will provide systems to hospitals to manage this feeder network. MDHSC plans to integrate financial and patient care information with clinical information, thus providing a complete patient management system.

3. SHARED MEDICAL SYSTEMS (SMS)

a. Products/Services

- Primarily remote computing services, turnkey systems, and, to a lesser degree, software products and professional services.

b. Markets Served

- Hospitals, group practices, and clinics.

c. Company Strategy

- SMS serves all hospitals with more than 100 beds, placing its system at the center of a network linking hospitals, medicare organizations, insurance companies, government agencies, and hospital supply companies.

- SMS, initially a successful provider of remote computing services to hospitals, physicians, and other health care providers, has steadily expanded its product line to include a comprehensive range of services--financial, administrative, patient care, and decision support systems--all offered on a remote computing basis, in-house turnkey approach, or a combination of the two.

- SMS was well positioned to take advantage of the market opportunities posed by PPS because it had an integrated data base management system that was precisely the type of system hospitals needed to implement case mix management.

- SMS offers the most complete product line in the medical data processing market.

d. Recent Activities

- The company has expanded the role of PCs in its hospital information networks through such applications as nurse staffing and medicare cost reporting.

- In 1985, SMS Corporation released three new products.

  - Its most important new product is the INDEPENDENCE System, an integrated financial management system and patient care system designed to run on IBM mainframes. This product gives the company for the first time the capability of offering hospitals a total in-house solution to their needs.

  - The second product released is SPIRIT, a turnkey system offering integrated patient care and financial software running on DEC VAX hardware.

  - The third product is a new Cost Accounting System.

e. Future Direction

- SMS sees an active market for replacement of outdated financial systems. Its role in the center of a large, integrated network may become a reality since data communications is becoming a driving force in the hospital data processing market. INPUT expects SMS to market more single- and multi-user microcomputer systems to reach new applications and customers.

- SMS is expected to grow 20% in 1986. It receives approximately 40% of its revenue from turnkey systems and is aggressively trying to expand this part of its business.

- SMS's size, stability, focus, and financial resources will enable it to devote considerable resources to research and development, allowing it to introduce new products as the technology becomes available.

4. BAXTER TRAVENOL LABORATORIES, INC.

a. Products/Services

- Software, facilities management, and turnkey systems.

b. Markets Served

- Travenol Healthcare Information Services comprises five divisions which serve different segments of the marketplace. These divisions are:

  - JS/DATA, with offerings for the small hospital market (under 200 beds) based on the IBM System/36.

  - Dynamic Control, which serves the mid-size market of 200-500 beds, running on the IBM System/38.

  - Integrated Healthcare Technologies, the combined offerings of Stony Brook Systems and PCI divisions, provides hospital information systems solutions to large institutions, primarily over 500 beds, on the IBM 43XX and 30XX series.

  - Compucare provides system integration and facilities management services across the hospital market, as well as a Data General-based HMO and HIS turnkey systems for the mid-sized hospital.

  - Physician Services offers management systems for the physician's office, clinic, and alternate site facilities based on the IBM PC and System/36.

c. Company Strategy

- With close to 500 hospital and 350 physician clients, Travenol is a leader in each of the market segments it serves. It is the fourth largest information services provider to the health care industry today in terms of the number of clients served. Travenol is now a viable, competitive company in this market.

d. Recent Activities

- Baxter Travenol Laboratories acquired Compucare in 1985. The acquisition makes Baxter, which had been building its information business group for the past few years, one of the largest companies in information systems for the health care industry. The combined sales of Compucare and Baxter's information business group could approach $100 million this year.

- The combination of Baxter's consulting abilities and Compucare's facilities management abilities should be a strong one. The wide line of Baxter's information systems products can now be deepened by the option of facilities management or internal operations consulting before and after the sale.

e. Future Direction

- With numerous divisions, continued investment in R&D, and a long-term strategy of becoming the leader in the health care market, Baxter Travenol plans to continue its success and remain one of the top vendors.

5. COMPUCARE, INC. (Subsidiary of Baxter Travenol Laboratories, Inc.)

a. Products/Services

- Professional services, turnkey systems, and applications software.

b. Markets Served

- Hospitals and physicians.

c. Company Strategy

- The company plays a key role in Baxter Travenol Corporation's strategy to be a full-line supplier to the fragmented health care market.

d. Recent Activities

- Compucare entered the physician office systems market in 1984. Compucare was acquired by Baxter Travenol in 1985.

e. Future Direction

- Baxter Travenol is likely to use Compucare as a vehicle to attack the financial and patient care segments of the hospital systems market. Compucare is developing an integrated clinical/fiscal system, based on a single computer system or a tightly coupled computer network with a single data base.

f. Key Competitors

- In providing facilities management services to hospitals, Compucare competes against Keane, Inc. and Mediflex Systems, Inc. Competition for the Patient Care Applications Software Division comes from Health Information Systems Inc., Mediflex, and IBM. In integrated systems, Compucare competes against SMS, McDonnell Douglas, HBO & Company, and IBM.

6. HBO & COMPANY

a. Products/Services

- Turnkey systems, packaged software, facilities management, and remote processing.

b. Markets Served

- Hospitals (patient care, finance and administration, decision support, and clinical department management).

c. Company Strategy

- HBO & Company views the hospital as the focal point of future health care delivery systems. The company intends to offer patient, departmental, financial, and decision support information systems as well as management consulting and facilities management services.

d. Recent Activities

- HBO & Company acquired two sizeable medical information services providers: Amherst & Associates, a leading medical industry consulting firm, and Mediflex, a supplier of software products and facilities management and decision support services.

  - Amherst Associates provides planning and financial modeling processing services, microcomputer software, turnkey systems, and management consulting to hospitals and other health organizations. Amherst Associates' revenue for calendar 1984 was approximately $30 million.

  - Mediflex Systems provides professional services facilities management, processing services, and IBM-based applications software products,

primarily to hospitals. Mediflex Systems' revenue for the fiscal year ending May 31, 1984 was approximately $28.7 million.

- HBO's acquisition of both Amherst and Mediflex is puzzling in the sense that both of these vendors are direct competitors in the financial modeling market. Moreover, digestion of the acquisition of the two has proven to be somewhat difficult.

e. Future Direction

- HBO & Company will place increased emphasis on hardware maintenance, systems for home health care agencies, and opportunities in the international marketplace. The company had a 1985 year-end backlog of about $285 million.

7. SYSTEM ASSOCIATES (SA)

a. Products/Services

- Turnkey systems.

b. Markets Served

- The systems are marketed under the SAINT trademark and consist of mini-computer-based networks designed specifically for hospitals. SAINT systems are targeted at acute care hospitals with between 50 and 300 beds. (According to System Associates, this represents 59% of the total U.S. client marketplace.) SA also targets extended care facilities and kidney dialysis centers.

c. Company Strategy

- System Associates aims to be a full service organization providing single vendor responsibility for virtually all aspects of its clients' data processing needs.

d. Recent Activities

- System Associates had a rough year which led them to lay off 12% of their staff. The company attributes its poor financial performance to a noticeable slowdown in new systems sales related to a recent lengthening in the data processing purchase decision cycle.

8. CYCARE SYSTEMS

a. Products/Services

- Processing services, software, and turnkey systems.

b. Markets Served

- Physicians and medical group practices, ambulatory care facilities, HMOs, and medical schools. CyCare Systems sells software for the management of patient information, scheduling, billing and insurance, and administrative functions.

c. Company Strategy

- CyCare System's strategy is to provide a broad range of services and systems to meet the expanding needs of the market and to increase geographic market penetration by expansion of direct sales coverage. The company is currently the largest provider of computer information processing services and systems to physicians and medical group practices.

d. Recent Activities

- CyCare Systems acquired Management Systems of Wausau, Inc. (MSWI) and Medical Computer Systems, Inc. (MCSI) from Employers Insurance of Wausau in the third quarter ot 1985. The purchase of MSWI and MCSI increased CyCare's client base from about 900 to approximately 1,200, strengthening its position in the small clinic market.

- In 1985, the company announced two new major products and one new service.

  - The CyCare HealthCare Network System, or C700, allows health care organizations to select various CyCare software and hardware components. These components are then "networked" to link hospital outpatient departments, primary care physicians, specialists, and HMOs to the source of outpatient care.

  - The CyCare 900, an IBM-based system designed for large multi-specialty groups, extends the company's software applications to the very largest health care providers.

  - CyCare introduced a professional services capability in 1985 to provide on-site management of a client's data processing department.

9. TECHNICON DATA SYSTEMS

a. Products/Services

- Processing services, software products, turnkey systems, and professional services.

b. Markets Served

- Technicon offers the Medical Information System, a comprehensive computerized patient care system.

- The Technicon Medical Data System for physicians' offices links to Technicon's Hospital Information System, tying doctors or clinics to each other or to hospitalized patients.

10. BURROUGHS CORPORATION

a. Products/Services

- Software and turnkey systems.

b. Markets Served

- Hospitals and physicians. Burroughs' Physician Office Accounting System (POAS) allows doctors at a workstation to interface with the hospital's data base, giving the physician the capability to seek information about his/her patients and issue orders.

c. Recent Activities

- Over the past two years, Burroughs has formed the Healthcare Services Division.

d. Future Direction

- The company's marketing thrust is to become the major single-source solution in the health care field.

11. MEDITECH

a. Products/Services

- Turnkey systems, processing services, and applications software.

b. Markets Served

- Hospitals, private laboratories, and prepaid health plans.

c. Company Strategy

- MEDITECH's line of applications modules for hospital patient care, clinical, and financial management requirements can be used independently or as part of an integrated system and may interface with applications from other vendors.

d. Recent Activities

- MEDITECH has recently added several software modules for a total of 16 patient care and financial modules.

12. CONTROL DATA CORPORATION HEALTHCARE SERVICES GROUP

a. Products/Services

- Software applications, processing services, and turnkey systems.

b. Markets Served

- Outpatient health care providers, hospital departments, and laboratories.

- CDC serves more than 200 clients.

c. Future Direction

- Financial problems call into question the company's ability to fund development that will allow it to adapt to a rapidly changing market.

13. KEANE, INC.

a. Products/Services

- Custom and packaged software and processing facilities management. KeaMed Hospital Systems markets a family of modular and integrated financial, patient care, and ancillary department systems for hospitals. Its products include the Hospital Information System/36 with integrated support programs and a family of modular hospital systems marketed as Worry-Free Software.

b. Markets Served

- Hospitals.

c. Recent Activities

- The KeaMed Hospital Systems Division introduced the Hospital Information System/36 (HIS/36) in June 1985. The system was developed by IBM with the cooperation of Keane. Sales of the system are a joint effort between IBM and Keane.

  - The HIS/36 consists of a patient registration, billing, and receivables module; a communications and results reporting module; and a medical records module.

IV INFORMATION SYSTEMS DEPARTMENT OUTLOOK

A. MAJOR ISSUES

1. DRIVING FORCES

- Reimbursement mechanisms play a significant role in the health care system. Since payments and services are separate, there is a need for a large and complex accounting system at the health care center level, the regional level, and the state level.

- Emphasis has been on automating previously manual processes, but is shifting toward productivity improvement systems due to recently introduced flat rate systems by Medicare and the promise of other such systems to follow.

- Exhibit IV-1 summarizes the driving forces for the medical/health care center.

2. ISSUES AND OBJECTIVES

- The key issues and objectives identified by respondents focused on organizing patient information and interfacing this data with regulatory, accounting, and payment systems. Some respondents identified an issue of using IS as a means to attract physicians.

EXHIBIT IV-1

MEDICAL/HEALTH CARE DRIVING FORCES

- Changing Reimbursement Mechanisms
- Government Regulations
- Improving Productivity

- Exhibits IV-2 and IV-3 list the most important IS issues and objectives identified by the respondents.

3. MANAGEMENT PERCEPTION AND ORGANIZATIONAL ISSUES

- Most respondents' management are unaware of the benefits that IS can provide. They perceive IS as solely a cost, primarily because of the late entry of most of these institutions to automation of their nonmedical functions.

- Respondents measure their performance by performing cost/benefit analyses on major projects and comparing budget expenditures to similar institutions' IS departments. None of the respondents believed that these measurements convinced management that IS is of strategic importance to the institution. Exhibit V-4 shows the measurement techniques used by the respondents.

- The IS departments in the medical sector have become more proactive to user needs. Previously, IS was totally reactive to user demands and poorly funded to meet the information systems needs of the organization. Respondents believe that in the next two years their role will become more consultative and they will provide more end-user access to authorized computer-based information.

- IS has become part of the corporate planning process in many institutions. It is the first indication that IS' role and status is increasing.

- The respondents believe IS can be used to improve the institution's competitive position, primarily by providing new, technology-based tools for physicians.

- Exhibit IV-5 shows that IS is highly centralized in this sector. Corporate IS controls over 80% of the information expenditures. In 1986, respondents project that there will be a slight shift in IS funding from corporate IS to end users, primarily for microcomputers and end-user systems that are part of the end-user budget.

EXHIBIT IV-2

MEDICAL/HEALTH CARE ISSUES

- More Complex Accounting Systems
- Centralized Patient Information
- Provide Automated Tools to Assist/ Attract Physicians
- Automate Manual Processes to Improve Productivity
- Regulatory Reporting Compliance

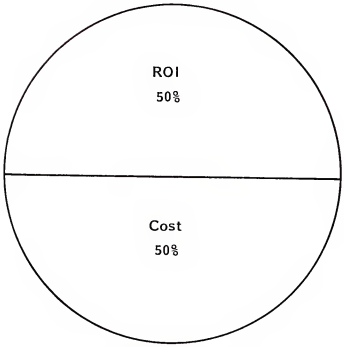
EXHIBIT IV-3

MEDICAL/HEALTH CARE OBJECTIVES

- Implement On-Line Accounting Data Base for Regulatory Reporting
- Improve Confidentiality of Patient Information
- Attract Physicians by Providing Innovative Services through Technology
- Implement Integrated Patient Care System
- Begin Supporting End-User Computing

EXHIBIT IV-4

MEDICAL/HEALTH CARE
I.S. MEASUREMENT TO MANAGEMENT



Percent of Responses

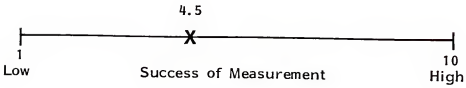


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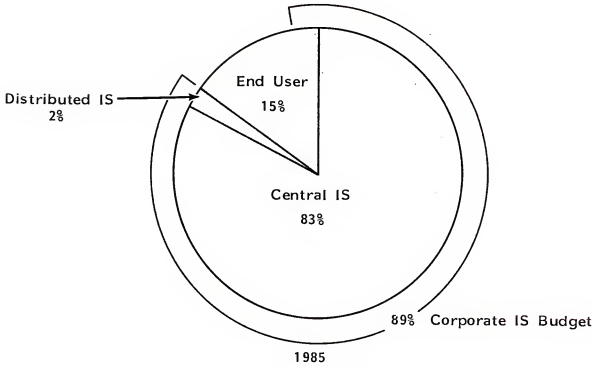
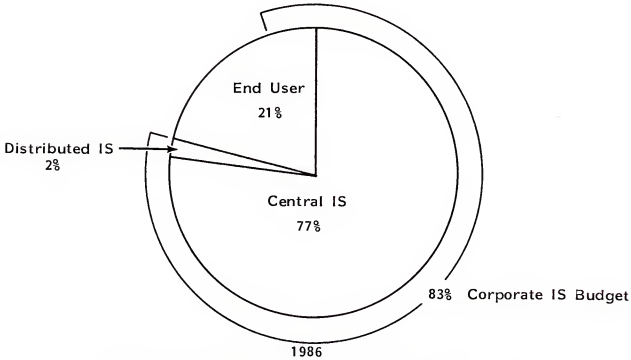
EXHIBIT IV-5

MEDICAL/HEALTH CARE
DISTRIBUTION OF CORPORATE COMPUTING EXPENSES





Percent of Corporate and Company-wide IS Budgets

INPUT

4. IMPACT OF TECHNOLOGY

- End-user computing has reduced the workload in many respondent institutions. In most cases, however, end-user computing support has existed for only one year.

- Departmental processors have a high impact on the medical sector's IS departments. Many hospital departments have their own processors to run scientific applications, which in turn have the greatest potential for linking with corporate information systems to provide local office automation and administrative support.

- Distributed systems development should also have a high impact on this sector. The availability of departmental processors provides the opportunity to develop local systems that can be used by other units. Coordinating and controlling these efforts is a major management challenge. Most respondents are beginning to plan for distributed systems development; however, implementation of this concept is at least three years away.

- Very few institutions in the medical sector planning to use relational data bases.

- Merging voice and data is being considered by some respondents, but is a low priority.

- There is a high demand for LANs in this sector. Networks must be established linking corporate and departmental systems. Implementation has been delayed due to a lack of LAN standards.

- Exhibit IV-6 summarizes the impact of the above technological issues on IS for the medical and health care sector.

EXHIBIT IV-6

MEDICAL/HEALTH CARE
IMPACT OF TECHNOLOGY

	IMPACT	COMMENTS
End-User Computing	Low/Medium	Potential to reduce IS workload. Most just beginning to support end users.
Departmental Processing	Medium/High	Many departments have their own processors - strategic need to integrate, support, and optimize benefits.
Distributed Systems Development	High	Heavy DDP environment with specialized computing needs.
Relational Data Bases	Low	Low activity.
Voice/Data Integration	Low	Not an immediate priority.
LANs	Medium/High	Lack of standards is delaying implementation, but the DDP environment requires a well-planned LAN strategy.

INPUT

5. END-USER COMPUTING

- End-user computing has great potential in this sector. The user community is well versed in the capabilities of computing. Departmental processing is being planned, as is the integration of departmental processors with corporate mainframes.

- End-user support is just beginning in this sector. IS is doing some end-user training through the information center. Tyically, respondent IS organizations are training the trainers in the end-user organization.

- Exhibit IV-7 summarizes IS' role in microcomputer support.

  - IS establishes guidelines for microcomputer acquisition.

  - The respondent IS departments do very little micro systems development, acting primarily in an advisory capacity.

  - IS primarily trains the trainers in the end-user departments.

  - IS takes no role in microcomputer maintenance in the respondent organizations.

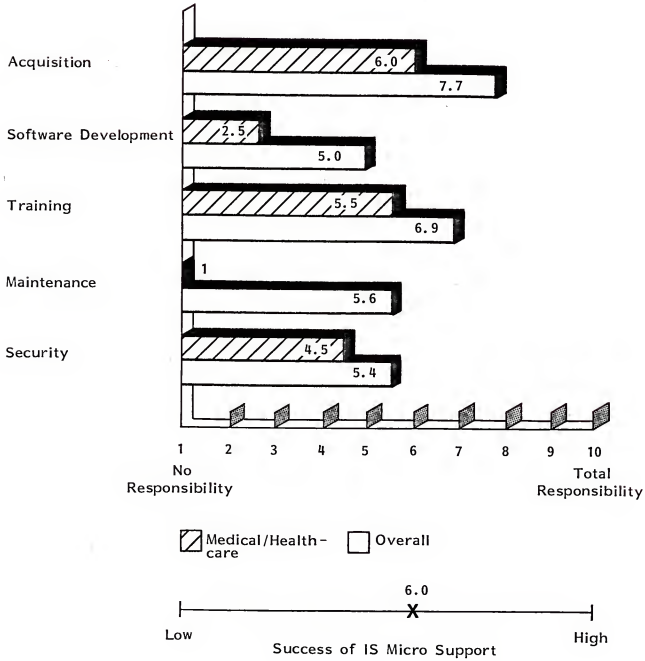
  - IS establishes security standards for the institution but takes no role in enforcement.

  - Although microcomputer support is just beginning, respondents believe they are providing adequate microcomputer support.

EXHIBIT IV-7

MEDICAL/HEALTH CARE

I.S. ROLE IN MICROCOMPUTER SUPPORT



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B. NEW APPLICATIONS

- The major new applications identified by respondents centered on building a patient information data base and enhancing payment-related systems (e.g., billing, claims, and finance and accounting).

- Contrary to other sectors, the medical and health care sector primarily uses external resources for development since most patient information and payment systems are complex packages. As shown in Exhibit IV-8, most institutions interviewed have relatively small development staffs and rely on purchased software packages for major applications.

- Exhibit IV-8 also lists the most important applications identified by the respondents.

C. BUDGET ANALYSIS

- The medical and health care sector's IS budgets grew slightly faster than IS budgets in general in 1985 and are projected to grow at a slightly slower rate in 1986. Most respondent organizations were in the final phases of implementing patient information and payment systems. Thus, 1986 will focus on solving installation problems and making minor enhancements to these systems, so growth in software and professional services will be reduced somewhat.

- The growing demand in end-user computing and the recognition of the important role microcomputers can play in this sector has caused microcomputers to be the highest budget growth area.

EXHIBIT IV-8

MEDICAL/HEALTH CARE
NEW APPLICATIONS IN 1985

Most Important Applications

Patient Information

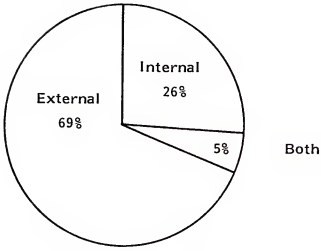
Billing

Office Systems and Decision Support

Finance and Accounting

Claims Processing

Source of Development (All Major New Applications)



Percent of Responses

Cost Range

$30K - $700K

INPUT

- Exhibit IV-9 shows the 1985 budget distribution and projects the growth of budget categories in 1986.

- Exhibit IV-10 compares this sector's IS growth in 1985 and projected growth in 1986 to the growth rates of IS budgets in general.

- Eighty-six percent of respondents project their IS budgets will increase in 1986, but most believe the budget will grow at a lower rate than 1985 (see Exhibit IV-11).

  - Factors contributing to increases in the IS budget include (in order of most frequently mentioned factors):

    - Software.

    - Hardware.

    - Personnel expense.

    - Regulatory requirements.

  - The main factor contributing to decreasing the IS budget is staff reductions.

- The medical and health care sector's IS budgets are more dependent on the institution's revenue and profit than IS budgets in general. Although management in this sector wants state-of-the-art technology, they are driven by the highly controlled and varied payment structure. IS budgets and other cost centers' spending are limited by these revenue constraints.

EXHIBIT IV-9

1985 BUDGET DISTRIBUTION AND 1985/1986 CHANGES
IN THE MEDICAL/HEALTH CARE SECTOR

BUDGET CATEGORY	1985 PERCENT OF I.S. BUDGET	1985-1986 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	37.8%	7.9%
Mainframe Processors	8.1	4.2
Minicomputers	5.6	0.0
Microcomputers	2.5	10.8
Mass Storage Devices	3.4	5.3
Other Hardware	9.6	0.0
Total Hardware	29.2%	2.7%
Data Communications	8.0%	9.0%
External Software	9.6	2.2
Professional Services	0.4	1.4
Turnkey Systems	3.0	0.0
Software Maintenance	1.0	4.4
Hardware Maintenance	5.9	6.6
Outside Processing Services	0.1	3.3
Other	5.0	10.0
Total	100.0%	9.5%

INPUT

EXHIBIT IV-10

MEDICAL/HEALTH CARE
I.S. BUDGETS ARE GROWING
AT THE SAME RATE AS ALL I.S. BUDGETS

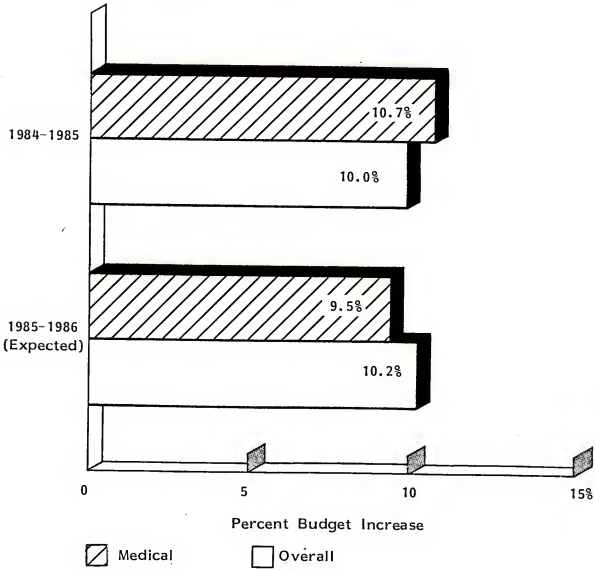


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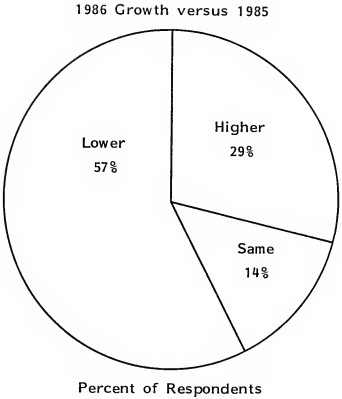
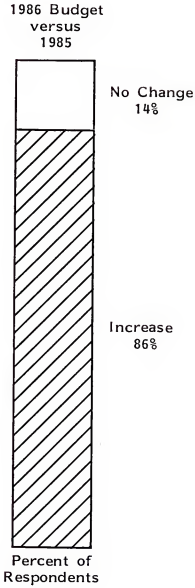
EXHIBIT IV-11

MEDICAL/HEALTH CARE
MOST BUDGETS ARE INCREASING BUT AT A LOWER RATE





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V NEW OPPORTUNITIES

A. INTEGRATED SYSTEMS

- Over the next 10 years, most hospitals will be installing totally integrated financial, clinical, and data communications systems to replace their fragmented, interfaced information processing systems.

  - Hospitals do not want a wide variety of different systems in their hospital; they want one that ties together all their needs and allows them to cope with the informational needs of the regulatory agencies and the intensely competitive environment they face.

- Old computer systems primarily monitored financial information. However, with the advent of Prospective Payment Systems, clinical information has taken a much more important role. Whereas these systems were separate, they must now be integrated.

- Hospitals are going to need systems that can account for what it costs them to deliver various services rather than what they paid for them. Most information systems which exist today are not designed to capture the costs on a direct basis.

  - The technology involved requires an integrated clinical/fiscal system--one computer system or a tightly coupled network and one data base,

with everything happening to a patient logged in real time. However, the development of these integrated systems will lead to longer sales cycles. Moreover, because of their complexity, these systems will spur the growth of the professional services market.

- Hospitals can no longer function with separate systems for financial operations, patient care, nursing management, laboratory management, medical records, etc. With separate systems, the same information must be re-entered in each subsystem, resulting in greater error rates and wasted manpower. A single, integrated system would boost efficiency and increase the quality of health care provided.

  - Future systems will require the integration of inpatient and outpatient systems.

- The computerization of clinical information systems is a critical area for the health care industry. Traditionally, clinical information is segmented into independent domains--laboratory, pharmacy, nursing, radiology, etc. As long as clinical information is segmented into these domains, timely action based on this information is impossible. Hospitals face the challenge of integrating clinical information systems with cost information systems.

B. NETWORKING

- In the future, networking capabilities of computer systems will become even more effective and far reaching. Systems must go beyond linking communications data bases; they must combine financial information with the ability to make faster, cost-effective patient care decisions.

- The ability of a doctor's office to tie into the hospital's inpatient system will enable a physician to monitor patient progress and reduce the amount of time spent calling orders to the hospital.

- Hospitals are beginning to install PCs in physicians' offices, thus improving the efficiency of the doctor, who can quickly find out patient status without visiting the hospital.

- A link to the hospital's outpatient services would allow rapid reporting of x-ray and laboratory results at the ordering physician's office.

- New "health information services" businesses will emerge to conform to the changing sites of health care delivery; examples include hospitals tying physicians' offices to their data processing systems. Hospitals will also begin communicating and sharing data with off-site clinics, physician groups, or other alternate locations such as surgical/emergicenters within the next three years. The hospital information system will be at the center of a community medical information network linking physicians' offices, independent laboratories, nursing homes, therapists, pharmacists, and other health care providers.

- General Electric has devised an electronic document exchange network to link hospital computers with those of insurance companies, thereby saving money.

  - An organization called NEIC, for National Electronic Information Corporation, has signed on to use GE's network. Owned by 11 insurers, NEIC coordinates the exchange of claims data among 46 insurance companies and 350 hospitals.

- The electronic transfer medical claims capabilities allow physicians to contact the insurance company electronically, speeding up payment. Since insurance companies want doctors to transmit insurance forms electronically, doctors are buying computers.

- The time is not far away when most claims will be electronically transmitted to third-party carriers. It is likely that carriers will mandate that claims be submitted to them in some electronic form.

C. OTHER NEW APPLICATIONS

- The new systems, functions, and features which have been introduced to the medical market recently and will continue to grow rapidly include:

  - Electronic claims transmission.

  - Cash flow and receivables management.

  - Software programs for decision support, modeling, planning, and market share analysis.

- As the number of hospitals continues to decrease, new types of delivery systems will emerge to take their place, such as ambulatory care centers, home health care, etc. These new delivery systems will provide new markets and new opportunities for information systems providers.

- The dramatic increase in the number of HMOs, emergency clinics, and laboratories offers opportunities for information service vendors. With continued rapid growth rates forecast throughout the 1990s, HMOs represent one of the most lucrative growth segments in the health care industry.

  - Managing an HMO organization requires a comprehensive, interconnected management system. HMOs will pay a premium for information and management tools that provide this capability. Vendors who possess these systems will be the likely survivors in this industry.

  - HMOs will be seeking state-of-the-art management information systems providing immediate feedback on plan operations.

- Medical records departments, which are trying to understand their case mix, must now look at data in a number of different ways to do trend analyses.

- To compare physicians' practice patterns and their attendant costs, hospitals must be able to merge financial data with patient care data, then analyze it.

- One of the major requirements now and in the future is for hospitals to have reliable and timely information on which to run the business. Since historically, government funding was reimbursement-based, hospital software needed only to tally patient expenditures. Now, hospitals must be able to calculate costs.

- The government's role in controlling hospital payment systems will no doubt increase, resulting in ever more complex reimbursement plans. Thus, there will be greater demand for detail-oriented, lower-cost analytical systems.

- The federal government's Health and Human Services (HHS) Department is trying to do to doctors what it did to hospitals. HHS is considering ways to throw out cost-based reimbursement in favor of approaches that reward more efficient practitioners. One possibility is "DRGs for Doctors," in which medicare would pay physicians for anesthesiology, radiology, surgery, and other services performed in a hospital setting--some 60% of medicare's expenditures--on an average-cost basis. If this happens, it would create a large, new demand for computer systems that could handle these calculations.

- An ancillary area recently addressed by computer systems is the operating room. A variety of operating room systems have begun to be installed. One of particular interest is called Intelemed. This system uses fourth generation language and windowing concepts to assist in operating room scheduling, inventory control, and other forms of operating room procedural tracking.

- There may be openings for software that uses artificial intelligence, such as software that assists MDs with patient diagnosis.

- Improved automation is required in the following health care management areas:

  - Operational cost data.

  - Government reimbursement guidelines.

  - Personnel cost data.

  - Patient care data.

  - Customer demographic data.

- There is a definite trend toward bringing computing to the bedside of the patient not only for nursing, but for the physician. Such systems can be thought of as electronic clipboards to help automate and simplify the clerical functions in patient care. In the near future, it is anticipated that each bedside will have terminals to aid in patient monitoring and diagnosis. These bedside terminals could eventually replace many manual physician orders, medical records, and nurses' notations through voice recognition data entry.

- In the short term, on-line data bases for medical information hold a great deal of promise. In the longer term, these services will be negatively impacted by the introduction of medical data bases on CD-ROMs.

VI CONCLUSIONS AND RECOMMENDATIONS

- In a market-driven health care environment, the challenge is for information service providers to organize so that they can quickly respond to changes in the market.

- Surviving vendors must begin to provide a full line of financial, patient care, and ancillary systems to accommodate the needs of all sizes of hospitals. Also of increasing importance is for companies in this business to move outside of the hospital by adding new clients to their base and in the future by providing systems to a wider variety of medical provider locations.

- All of today's leaders in the market developed their products in an era of "cost-plus" medicine. These old-line vendors are at risk to the extent that they cannot respond to today's changing market. A new vendor developing new hardware or software may be able to develop a product that will outperform a system built for another era and subsequently modified.

- The most promising products and services will be those designed to reduce costs. New information systems will have to be cost-justified. Systems will have to improve productivity or reduce costs since there is no longer anyone to pass the cost on to.

- Healthcare systems of the future will become increasingly complex as the emphasis on cost containment through information management and the number of participating physicians, clinics, hospitals, and patients rises.

APPENDIX ME: FORECAST DATA BASE: MEDICAL SECTOR

- This appendix contains the following forecast information, as shown in Exhibits ME-1 through ME-4:
  - Market size by delivery mode for each year 1985-1991.
  - Market growth rates for 1985-1986.
  - Average annual growth rate (AAGR) for each delivery mode for the five-year period 1986-1991.

EXHIBIT ME-1

MEDICAL INDUSTRY SECTOR
INDUSTRY-SPECIFIC AND CROSS-INDUSTRY
USER EXPENDITURE FORECASTS, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
INDUSTRY SPECIFIC	928	17%	1087	1265	1464	1705	1993	2332	16%
CROSS INDUSTRY	136	13%	154	173	196	214	242	277	12%
TOTAL PROCESSING	1064	17%	1241	1438	1660	1919	2235	2609	16%
APPLICATION SOFTWARE									
MAINFRAME/MINI									
INDUSTRY SPECIFIC	252	45%	366	512	717	997	1365	1638	35%
CROSS INDUSTRY	144	19%	172	205	243	292	357	411	19%
TOTAL MAINFRAME/MINI	396	36%	538	717	960	1289	1722	2049	31%
MICRO									
INDUSTRY SPECIFIC	44	64%	72	113	180	265	392	529	49%
CROSS INDUSTRY	87	17%	102	123	146	188	222	262	21%
TOTAL MICRO	131	33%	174	236	326	453	614	791	35%
TOTAL APPLICATION SOFTWARE									
INDUSTRY SPECIFIC	296	48%	438	625	897	1262	1757	2167	38%
CROSS INDUSTRY	231	19%	274	328	389	480	579	673	20%
TOTAL APPLICATION SOFTWARE	527	35%	712	953	1286	1742	2336	2840	32%
TURNKEY SYSTEMS									
INDUSTRY SPECIFIC	516	17%	604	713	841	992	1181	1394	18%
CROSS INDUSTRY	244	12%	274	314	370	435	486	543	15%
TOTAL TURNKEY SYSTEMS	760	16%	878	1027	1211	1427	1667	1937	17%
PROFESSIONAL SERVICES	220	21%	266	324	399	494	598	724	22%
SECTOR TOTAL									
INDUSTRY SPECIFIC	1740	22%	2129	2603	3202	3959	4931	5893	23%
CROSS INDUSTRY	831	16%	968	1139	1354	1623	1905	2217	18%
TOTAL	2571	20%	3097	3742	4556	5582	6836	8110	21%

EXHIBIT ME-2

MEDICAL INDUSTRY SECTOR - HOSPITAL
INDUSTRY-SPECIFIC
USER EXPENDITURE FORECASTS, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES	773	17%	903	1047	1208	1403	1645	1925	16%
APPLICATION SOFTWARE									
MAINFRAME/MINI	207	43%	296	410	566	778	1078	1294	34%
MICRO	29	55%	45	67	101	140	220	297	46%
TOTAL APPLICATION SOFTWARE	236	44%	341	477	667	918	1298	1590	36%
TURNKEY SYSTEMS	397	17%	463	543	637	748	895	1056	18%
TOTAL	1406	21%	1707	2067	2512	3069	3838	4572	22%

EXHIBIT ME-3

Medical Industry Sector

MEDICAL INDUSTRY SECTOR - PHYSICIAN
INDUSTRY-SPECIFIC
USER EXPENDITURE FORECASTS, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES	136	20%	163	193	227	268	309	362	17%
APPLICATION SOFTWARE									
MAINFRAME/MINI	38	50%	57	83	120	173	229	275	37%
MICRO	13	85%	24	41	70	111	153	206	54%
TOTAL APPLICATION SOFTWARE	51	59%	81	124	190	284	382	481	43%
TURNKEY SYSTEMS	103	19%	123	148	178	214	250	295	19%
TOTAL	290	27%	367	465	595	766	941	1138	25%

EXHIBIT ME-4

MEDICAL INDUSTRY SECTOR - OTHER
INDUSTRY-SPECIFIC
USER EXPENDITURE FORECASTS, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES	19	16%	22	25	29	34	40	47	16%
APPLICATION SOFTWARE									
MAINFRAME/MINI	8	50%	12	19	30	46	57	68	42%
MICRO	2	100%	4	6	9	13	20	27	46%
TOTAL APPLICATION SOFTWARE	10	60%	16	25	39	59	77	95	43%
TURNKEY SYSTEMS	15	20%	18	21	25	30	35	41	18%
TOTAL	44	27%	56	72	94	123	152	184	27%